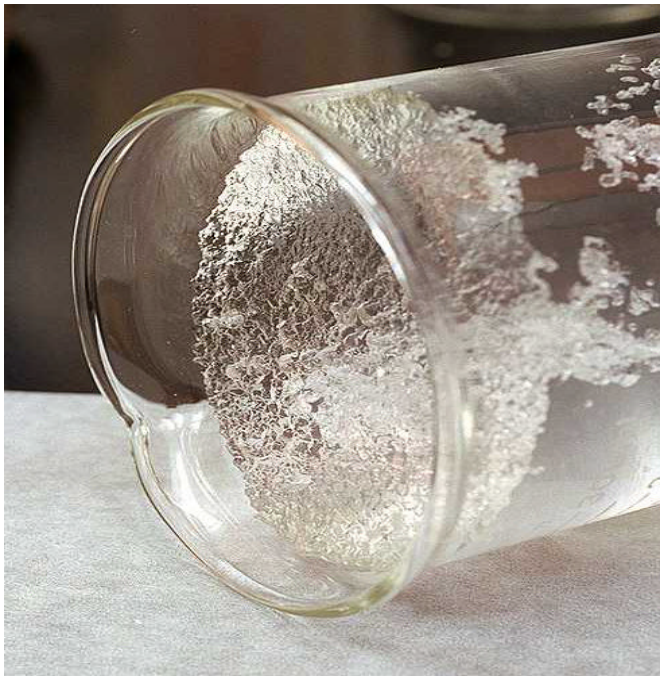
MOUND

Environmental Restoration Program

The MOUND Tritium D&D Large-Scale Demonstration and Deployment Project

# WATERWORKS CRYSTALS® AQUEOUS LIQUID SOLIDIFICATION AGENT



## THE NEED

During fiscal year 1999, the U.S. Department of Energy Mound Environmental Management Project (DOE-MEMP) Office and BWXT of Ohio, Inc. conducted a demonstration using WaterWorks Crystals® aqueous liquid superabsorbent. This demonstration compared the organic polyacrylate super absorber to the baseline immobilization agents which include Aquaset® and cement. The Tritium D&D program at Mound generates large quantities of low level tritium contaminated aqueous waste. The stabilization of this waste for shipment and disposal results in a weight, and in some cases, volume increase of the final waste form compared to the liquid waste itself. More effective stabilizing agents can translate into larger waste loading per drum and a corresponding reduction in the cost of stabilization, transportation, and disposal.

## THE TECHNOLOGY

The innovative technology demonstrated in the Mound LSDDP was an organic polyacrylate that has very high absorbent capabilities for aqueous liquids. Under specific conditions, it achieves weight ratios of up to 200:1 water to absorbent. The absorbent used in the demonstration was WaterWorks Crystals® made by WaterWorks America, Inc. The product is non-toxic and non-biodegradable. It is highly resistant to the effects of radiation and withstands standard freeze/thaw test environments. There are other similar products in the polyacrylate family that have the same basic capabilities and limitations. These products work well with aqueous solutions and can tolerate some mineral/salt content along with the presence of inorganic sludges. They do not work for organic liquids. They require no mixing when added to a liquid and there is essentially no increase in volume.

## THE DEMONSTRATION

The demonstration involved several phases to determine the properties of a variety of water/absorbent ratios. These included bench scale tests with 350 ml. volumes of water. A standard paint filter test was used as an indicator of appropriate immobilization. The results of this phase were applied to 55 gallon drums containing 53 gallons of tap water. Samples were collected from the bottom of stabilized drums to determine if the absorbent properties were uniform along the vertical axis of the waste container. A drum immobilized at the preferred ratio was subjected to over-the-road vibration and impact tests.

## RESULTS

The bench scale test provided data that indicated the upper bounds of the water to absorbent ratios. Subsequent testing with 55 gallon drums containing 53 gallons of tap water demonstrated that ratios of up to 100:1 are possible. The Mound preferred ratio of 50:1 was primarily chosen to provide a significant margin of safety for the final waste form and to meet some burial site criteria that specify using twice the amount of absorbent needed. Drilling holes at the base of the drum indicated that the performance of the absorbent was consistent throughout the vertical axis. The waste form at a 50:1 ratio also passed the vibration and impact tests. The amount of polyacrylate absorbent used at 50:1 was about 8.8 lbs. compared to 200 lbs. for the baseline absorbent. Material costs alone favor the polyacrylate by a 4:1 ratio per gallon of water absorbed.

BWXT of Ohio, Inc.

NETL NATIONAL ENERGY TECHNOLOGY LABORATORY

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# WaterWorks Crystals®
# Superabsorbent Polymer

## An innovative waste water solidification technology
## by WaterWorks America, Inc

This absorbing agent performs safe, efficient solidification of radioactive / contaminated waste water and provides an acceptable means of transportation and disposal.

**BENEFITS**

- A single step process that requires no mixing
- Minimizes processing times by reducing handling and setup times
- Reduces worker exposure
- Increases productivity
- Provides an overall price reduction for treatment and disposal of tritiated water

**MATERIAL**

- High technology polymer
- Crystals are white, odorless, granules approximately 400 microns in size
- Non-toxic and non-biodegradable
- Water to absorbent capacity of up to 200:1 wt. %, variable per waste and stress
- Absorbs quickly with essentially no increase in volume

**BASELINE TECHNOLOGY**

- Solidification with Aquaset®, concrete, plaster or lime